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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
HICKS, MICHAEL J	
ART UNIT	PAPER NUMBER
2165	

DATE MAILED: 11/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/757,801	WANG, BING
	Examiner	Art Unit
	Michael J. Hicks	2165

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 September 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-21 Pending.

Response to Arguments

2. Applicant's arguments filed 9/12/2006 have been fully considered but they are not persuasive.

As per Applicants arguments that Lin does not disclose or suggest a rule that applies to a range of key values and fails to disclose searching a plurality of objects defining key ranges to identify an object that defines a smallest range of key values that includes a provided key, Examiner respectfully disagrees. As shown in In re Rose, 105 USPQ 237 (CCPA 1955), changes in size or range are generally not given patentable weight or would have been obvious improvements, thus limiting the claimed invention to include objects that may define a range of rules as opposed to a single rule does not overcome the rejection. Furthermore, as all objects which define key ranges that include the provided key will be determined in the other search method, the at least one object which defines the smallest key range that includes the provided key will be determined as a result of finding the complete set.

In light of these arguments, the rejection of claims 1-21 in under USC 103 will be updated to reflect the amendments made to the claims and maintained.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-21 rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (U.S. Pre Grant Publication Number 2002/0133619 and referred to hereinafter as Lin) in view of Bremer et al. (U.S. Patent Number 6,553,002 and referred to hereinafter as Bremer).

In Claims 1, 11, and 21, Lin discloses a method for associating at least one rule with a key (i.e. *"A network device includes at least one network port, a masks table, a rules table, a pointers table, and a fast filter processor. The masks table contains filter information and a mask key. The rules table contains corresponding rules to the filter information and is related to the mask table by the mask key. The pointers table contains boundary data related to the rules for corresponding filter information. The fast filter processor is coupled to the mask table, the rules table and the pointers table, and configured to perform at least one binary search for at least one rule related to a data packet received by the network device at the at least one network port, the binary search being limited based on the boundary data in the pointers table."* The preceding text excerpt clearly indicates that, in the invention, rules are associates with keys in tables in a network device.) (Abstract), comprising: arranging a plurality of objects in a table based on an ordering of information associated with each object, wherein each object defines a key range comprising at least one key value and at least one of the key values comprises multiple key values (i.e. *"Referring to FIG. 11, shown is an exemplary table to be searched, which could be any of the on-chip tables already described*

above…The rules and pointers tables can be set-up during programming or initiation as described above. A method for creating and maintaining pointers table is described below with reference to FIG. 13." The preceding text excerpt clearly indicates that rules pointers, addresses, and masks are all arranged in searchable tables based on an ordering of information (e.g. min/max information). Note that In re Rose, 105 USPQ 237 (CCPA 1955) teaches that changes in size or range are generally not given patentable weight or would have been obvious improvements.) (Paragraphs 140-142); if the key is provided, employing at a search method to determine a starting object entry in the table (i.e. *"Next, at step S14-7, the binary search obtains a rule and compares it to the filtered packet for a match. If there is a match, then the rule is stored at step S14-8 to be processed by internal switch logic, and the processing proceeds directly to step S14-10 from step S14-8. Otherwise, if there is no match, then at step S14-9 it is checked to see if there are any steps left in the binary search. If the binary search is not complete, then processing returns to step S14-7, and the binary search performs the next step and checks for a match with another rule."* The preceding text excerpt clearly indicates a search is performed on the key to determine a starting object entry in the table.) (Paragraph 150) and enabling the processing of the provided key based on at least one rule associated with the determined object, wherein the at least one rule applies to all key values of the key range of the determined object (i.e. *"Next, at step S14-7, the binary search obtains a rule and compares it to the filtered packet for a match. If there is a match, then the rule is stored at step S14-8 to be processed by internal switch logic, and the processing proceeds directly to step S14-10 from step S14-8. Otherwise, if there is no match, then at step S14-9 it is checked to see if there are any steps left in the binary search. If the binary search is not complete, then processing returns to step S14-7, and the binary search performs the next step and checks for a match with another rule. When the binary search is complete or a rule has been matched, then the search is terminated at step S14-10. At step S14-11, a next mask is obtained, and steps S14-3 through step S14-11 are repeated until no more masks exist for which to search. At step S14-12, the internal switch logic applies the rules stored as appropriate.*

Processing ends at step S14-13." The preceding text excerpt clearly indicates that rules associated with the key are processed upon search completion. Note that the rule is compared to the filtered packet (e.g. object) for a match, thus in order to be a match for an object associated with a key range, the rule must applie to all keys in that range.) (Paragraph 150).

Lin fails to disclose if the starting entry in the table is unequal to the provided key, employing another search method to determine an object in the table that is relatively equivalent to the key.

Bremer discloses if the key range of the starting object entry in the table is unequal to the provided key, employing another search method to determine the at least one object in the table that defines a smallest range of key values that includes the provided key (i.e. *"The route stack and the attached routes provide an advantage over conventional search tree systems. In a conventional Patricia search tree, when a non-matching address is located in a leaf node, the router must go back up the nodes of the Patricia tree and try to determine another route for the data packet. However, in accordance with the invention, each node may have an attached route which stores alternative routes so that the route stack stores each of these other routes during the downwards traversal of the search tree so that an alternate route may be located without having to traverse any nodes of the search tree again which reduces the time to find a alternate route."* The preceding text excerpt clearly indicates that a second search method may be applied which follows alternate routes until the closest match is found. Note that as all matching objects (e.g. objects which define a range of keys which includes the provided key) will be determined by the search, the at least one object which defines the smallest range of keys which includes the provided key will be determined in the full set of matches.) (Column 13, Lines 12-22).

It would have been obvious to combine the teachings of Lin and Bremer with the motivation of determining forwarding destinations (e.g. IP addresses) for packets using a routing table and a unique search tree (Bremer, Abstract).

In Claims 2, and 12, Lin teaches the search method includes at least a binary search (i.e. *"Next, at step S14-7, the binary search obtains a rule and compares it to the filtered packet for a match."* The preceding text excerpt clearly indicates that the search is a binary search.) (Paragraph 150).

In Claims 3 and 13, Lin teaches the search method determines if the provided key is equal to a single key associated with one object in the table (i.e. *"Next, at step S14-7, the binary search obtains a rule and compares it to the filtered packet for a match. If there is a match, then the rule is stored at step S14-8 to be processed by internal switch logic, and the processing proceeds directly to step S14-10 from step S14-8."* The preceding text excerpt clearly indicates that the key is matched to a single key/object in the table.) (Paragraph 150).

In Claims 4 and 14, Lin teaches, the search method determines if the provided key is equal to a lower bound of a range of keys associated with one object in the table (i.e. *"Referring back to FIG. 8, EPIC may also include a pointers table 221 for maintaining the maximum (MAX) and minimum (MIN) addresses of rules for corresponding masks. As described above, masks (filters) may be related to rules by a key. Accordingly, as an example, pointers table 221 may be created to maintain the rules MAX and MIN addresses (boundary) for each mask."* The preceding text excerpt clearly indicates that the binary search will attempt to determine a match for the key and will determine

that it is a lower bound match due to the storing of the MIN and MAX boundaries for each mask/range of keys.) (Paragraph 142).

Lin fails to teach, the other search method operates in a descending direction across the table.

Bremer teaches, the other search method operates in a descending direction across the table (i.e. *"The route stack and the attached routes provide an advantage over conventional search tree systems. In a conventional Patricia search tree, when a non-matching address is located in a leaf node, the router must go back up the nodes of the Patricia tree and try to determine another route for the data packet. However, in accordance with the invention, each node may have an attached route which stores alternative routes so that the route stack stores each of these other routes during the downwards traversal of the search tree so that an alternate route may be located without having to traverse any nodes of the search tree again which reduces the time to find a alternate route."* The preceding text excerpt clearly indicates that the other method will follow a similar search path as the first search method, but take an alternate route which skips certain nodes. Because the table is sorted, if the first search method searches for the lower bounds, it will be searching in a descending direction across the table; subsequently, when the other search method begins, it will follow a similar, but alternate, route which would also search in a descending direction across the table, bypassing certain nodes.) (Column 13, Lines 12-22).

It would have been obvious to combine the teachings of Lin and Bremer with the motivation of determining forwarding destinations (e.g. IP addresses) for packets using a routing table and a unique search tree (Bremer, Abstract).

In Claims 5 and 15, Lin teaches, the search method determines if the provided key is equal to an upper bound of a range of keys associated with one object in the table (i.e. *"Referring back to FIG. 8, EPIC may also include a pointers table 221 for maintaining the*

maximum (MAX) and minimum (MIN) addresses of rules for corresponding masks. As described above, masks (filters) may be related to rules by a key. Accordingly, as an example, pointers table 221 may be created to maintain the rules MAX and MIN addresses (boundary) for each mask." The preceding text excerpt clearly indicates that the binary search will attempt to determine a match for the key and will determine that it is an upper bound match due to the storing of the MIN and MAX boundaries for each mask/range of keys.) (Paragraph 142).

Lin fails to teach, the other search method operates in an ascending direction across the table.

Bremer teaches, the other search method operates in an ascending direction across the table (i.e. *"The route stack and the attached routes provide an advantage over conventional search tree systems. In a conventional Patricia search tree, when a non-matching address is located in a leaf node, the router must go back up the nodes of the Patricia tree and try to determine another route for the data packet. However, in accordance with the invention, each node may have an attached route which stores alternative routes so that the route stack stores each of these other routes during the downwards traversal of the search tree so that an alternate route may be located without having to traverse any nodes of the search tree again which reduces the time to find a alternate route."* The preceding text excerpt clearly indicates that the other method will follow a similar search path as the first search method, but take an alternate route which skips certain nodes. Because the table is sorted, if the first search method searches for the upper bounds, it will be searching in an ascending direction across the table; subsequently, when the other search method begins, it will follow a similar, but alternate, route which would also search in an ascending direction across the table, bypassing certain nodes.) (Column 13, Lines 12-22).

It would have been obvious to combine the teachings of Lin and Bremer with the motivation of determining forwarding destinations (e.g. IP addresses) for packets using a routing table and a unique search tree (Bremer, Abstract).

In Claims 6 and 16, Lin teaches the key is at least one of an IP address and a telephone number (i.e. *"According to an embodiment of the present invention, provided is a method of filtering a packet in a network device, wherein the network device has a data packet input port and is configured to perform at least one network function. The method includes a steps of providing a masks table, a rules table and a pointers table. The method also includes a step of relating mask data in the masks table to rules data in the rules table with a key, one of the mask data corresponding to one or more of the rules data. The method also includes a step of defining pointer data in the pointers tables defining a maximum and minimum address of corresponding rule data for each of the mask data receiving a data packet at the data packet input port. The method also includes a step of multiplying the data packet with one of the mask data to produce a product. The method also includes a step of searching the rules table based on the product and the maximum and minimum address data for the one of the mask data for a match between the product and rules data corresponding to the one of the mask data. The method also includes a step of outputting the match to a function within the network device in order to perform the at least one network function."* The preceding text excerpt clearly indicates that the method deals with packet forwarding, and that the search is performed to match addresses (e.g. IP addresses).) (Paragraphs 9-10).

In Claims 7 and 17, Lin teaches the key is the IP address and information associated with the object includes at least one of a bound IP address, sister bound IP address, type, index, sister index, and rule (i.e. *"According to an embodiment of the present invention, provided is a method of filtering a packet in a network device, wherein the network device has a data packet input port and is configured to perform at least one network function. The method includes a steps of providing a masks table, a rules table and a pointers table. The method also includes a step of relating mask data in the masks table to rules data in the rules table with a key, one of the mask data*

corresponding to one or more of the rules data. The method also includes a step of defining pointer data in the pointers tables defining a maximum and minimum address of corresponding rule data for each of the mask data receiving a data packet at the data packet input port. The method also includes a step of multiplying the data packet with one of the mask data to produce a product. The method also includes a step of searching the rules table based on the product and the maximum and minimum address data for the one of the mask data for a match between the product and rules data corresponding to the one of the mask data. The method also includes a step of outputting the match to a function within the network device in order to perform the at least one network function." The preceding text excerpt clearly indicates that the associated information contains rules.) (Paragraphs 9-10).

In Claims 8 and 18, Lin teaches the table includes at least an array, wherein the information associated with each object is sorted in the array (i.e. *"Assuming that table 1100 is sorted in an order, a binary search is extremely efficient."* The preceding text excerpt clearly indicates that the table is in sorted order. Note that it is common for tables to be stored as arrays n memory.) (Paragraph 140).

In Claims 9 and 19, Lin teaches enabling the processing of the given key based on at least one rule associated with an object that is associated with the lower bound (i.e. *"Next, at step S14-7, the binary search obtains a rule and compares it to the filtered packet for a match. If there is a match, then the rule is stored at step S14-8 to be processed by internal switch logic, and the processing proceeds directly to step S14-10 from step S14-8. Otherwise, if there is no match, then at step S14-9 it is checked to see if there are any steps left in the binary search. If the binary search is not complete, then processing returns to step S14-7, and the binary search performs the next step and checks for a match with another rule. When the binary search is complete or a rule has been matched, then the search is terminated at step S14-10. At step S14-11, a next mask is obtained, and steps S14-3 through step S14-11*

are repeated until no more masks exist for which to search. At step S14-12, the internal switch logic applies the rules stored as appropriate. Processing ends at step S14-13." The preceding text excerpt clearly indicates that rules associated with the keys are processed upon search completion.) (Paragraph 150).

Lin fails to teach that the other search method further includes: searching from the starting entry in a descending direction across the table to iteratively determine a lower bound of the smallest key range, wherein the other search method enables jumping over other objects in the table to determine the lower bound.

Bremer teaches, the other search method further includes: searching from the starting entry in a descending direction across the table to iteratively determine a lower bound of the smallest key range (i.e. *"The route stack and the attached routes provide an advantage over conventional search tree systems. In a conventional Patricia search tree, when a non-matching address is located in a leaf node, the router must go back up the nodes of the Patricia tree and try to determine another route for the data packet. However, in accordance with the invention, each node may have an attached route which stores alternative routes so that the route stack stores each of these other routes during the downwards traversal of the search tree so that an alternate route may be located without having to traverse any nodes of the search tree again which reduces the time to find a alternate route."* The preceding text excerpt clearly indicates that the other method will follow a similar search path as the first search method, but take an alternate route which skips certain nodes. Because the table is sorted, if the first search method searches for the lower bounds, it will be searching in a descending direction across the table; subsequently, when the other search method begins, it will follow a similar, but alternate, route which would also search in a descending direction across the table, bypassing certain nodes. As the smallest key range is identified in preceding steps, the bounds of the smallest key range may be identified in this manner.) (Column 13, Lines 12-22), wherein the other search method enables jumping over

other objects in the table to determine the lower bound (i.e. *"The route stack and the attached routes provide an advantage over conventional search tree systems. In a conventional Patricia search tree, when a non-matching address is located in a leaf node, the router must go back up the nodes of the Patricia tree and try to determine another route for the data packet. However, in accordance with the invention, each node may have an attached route which stores alternative routes so that the route stack stores each of these other routes during the downwards traversal of the search tree so that an alternate route may be located without having to traverse any nodes of the search tree again which reduces the time to find a alternate route."* The preceding text excerpt clearly indicates that the other search method takes an alternate route which nodes of the search tree may not have to be traversed (e.g. objects in the table my be jumped over).) (Column 13, Lines 12-22).

It would have been obvious to one skilled in the art at the time of applicants invention to modify the teachings of Lin to with the teachings of Bremer to include searching from the starting entry in a descending direction across the table to iteratively determine a lower bound of the smallest key range, wherein the other search method enables jumping over other objects in the table to determine the lower bound with the motivation of determining forwarding destinations (e.g. IP addresses) for packets using a routing table and a unique search tree (Bremer, Abstract).

In Claims 10 and 20, Lin teaches enabling the processing of the key based on at least one rule associated with the one object that is associated with the upper bound (i.e. *"Next, at step S14-7, the binary search obtains a rule and compares it to the filtered packet for a match. If there is a match, then the rule is stored at step S14-8 to be processed by internal switch logic, and the processing proceeds directly to step S14-10 from step S14-8. Otherwise, if there is no match, then at step S14-9 it is checked to see if there are any steps left in the binary search. If the binary search is not complete, then*

processing returns to step S14-7, and the binary search performs the next step and checks for a match with another rule. When the binary search is complete or a rule has been matched, then the search is terminated at step S14-10. At step S14-11, a next mask is obtained, and steps S14-3 through step S14-11 are repeated until no more masks exist for which to search. At step S14-12, the internal switch logic applies the rules stored as appropriate. Processing ends at step S14-13." The preceding text excerpt clearly indicates that rules associated with the key are processed upon search completion.) (Paragraph 150).

Lin fails to teach, the other search method further includes: searching from the starting entry in an ascending direction across the table to iteratively determine an upper bound of the smallest key range, wherein the other search method enables jumping over other objects in the table to determine the upper bound.

Bremer teaches, the other search method further includes: searching from the starting entry in an ascending direction across the table to iteratively determine an upper bound of the smallest key range (i.e. *"The route stack and the attached routes provide an advantage over conventional search tree systems. In a conventional Patricia search tree, when a non-matching address is located in a leaf node, the router must go back up the nodes of the Patricia tree and try to determine another route for the data packet. However, in accordance with the invention, each node may have an attached route which stores alternative routes so that the route stack stores each of these other routes during the downwards traversal of the search tree so that an alternate route may be located without having to traverse any nodes of the search tree again which reduces the time to find a alternate route."* The preceding text excerpt clearly indicates that the other method will follow a similar search path as the first search method, but take an alternate route which skips certain nodes. Because the table is sorted, if the first search method searches for the upper bounds, it will be searching in an ascending direction across the table; subsequently, when the other search method begins, it will follow a similar, but alternate, route which would also search in an ascending direction across the table, bypassing certain nodes. As the smallest

key range is identified in preceding steps, the bounds of the smallest key range may be identified in this manner.) (Column 13, Lines 12-22), wherein the other search method enables jumping over other objects in the table to determine the upper bound (i.e. *"The route stack and the attached routes provide an advantage over conventional search tree systems. In a conventional Patricia search tree, when a non-matching address is located in a leaf node, the router must go back up the nodes of the Patricia tree and try to determine another route for the data packet. However, in accordance with the invention, each node may have an attached route which stores alternative routes so that the route stack stores each of these other routes during the downwards traversal of the search tree so that an alternate route may be located without having to traverse any nodes of the search tree again which reduces the time to find a alternate route."* The preceding text excerpt clearly indicates that the other search method takes an alternate route which nodes of the search tree may not have to be traversed (e.g. objects in the table my be jumped over).) (Column 13, Lines 12-22).

It would have been obvious to one skilled in the art at the time of applicants invention to modify the teachings of Lin to with the teachings of Bremer to include the other search method further includes: searching from the starting entry in an ascending direction across the table to iteratively determine an upper bound of the smallest range of keys, wherein the other search method enables jumping over other objects in the table to determine the upper bound with the motivation of determining forwarding destinations (e.g. IP addresses) for packets using a routing table and a unique search tree (Bremer, Abstract).

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Points of Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Hicks whose telephone number is (571) 272-2670. The examiner can normally be reached on Monday - Friday 10:00a - 7:00p.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Gaffin can be reached on (571) 272-4146. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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